

Remarks/Arguments

In the Final Office Action dated April 13, 2011, it is noted that claims 10, 11, 13, and 15-17 are pending in this application; and that all the claims stand rejected under 35 U.S.C. §112 and 35 U.S.C. §103.

By this response, claims 15 and 16 have been cancelled without prejudice. Also, claim 10 has been amended to remove a number of limitations added during the prior prosecution of this application. Further, claim 10 has been amended to include the limitations from now cancelled claims 15 and 16 and from a claim listed and identified as “new claim 18” in the prior unentered amendatory response – the response filed on June 15, 2011. Certain deleted limitations from claim 10 have been reintroduced in dependent new claims 18-19. Editorial changes have been made to claim 11. Support for the amendments at the end of claim 10 can be found principally at page 4, lines 9-10 and at page 6, lines 6-8 of the original specification. All the amendments to the claims appear to be proper and justified. No new matter has been added.

Rejection under 35 U.S.C. §112

Claims 10, 11, 13, 15, and 17 stand rejected under 35 U.S.C. §112, first and second paragraphs. As noted above, claim 15 and 16 have been cancelled and claim 10 has been amended.

This rejection is based on the inclusion of “means for focusing the light beam emitted by the optical source close to the entry face of the integrator device” at least in the base independent claim 10. Contrary to the Examiner’s assertions on pages 3 and 4 of the present Office Action, it should be understood that the specification as originally filed includes support for this limitation at least at page 9, lines 4-6.

In spite of the existing clear and definite support for this limitation and in an effort to advance the prosecution of this case on the merits, the focusing element has been deleted from the claims without prejudice. As a result, it is submitted that the grounds for these rejections are now obviated and that claims 10, 11, 13, and 17 are all clear, definite, enabled, and allowable under 35 U.S.C. §112. Withdrawal of the rejection is respectfully requested.

Cited Art

The following references have been cited and applied in the present Office Action: Japanese Patent Publication JP 0426720A to Yajima; U.S. Patent Application Publication No. 2004/0160578 to Lu (hereinafter “*Lu*”); and U.S. Patent 5,634,704 to Shikama et al. (hereinafter “*Shikama*”).

Rejection under 35 U.S.C. §103

Claims 10, 11, 13, and 15-17 stand rejected under 35 U.S.C. §103 as unpatentable over Yajima in view of Lu and Shikama. As noted above, claim 15 has been cancelled and claim 10 has been amended. This rejection is respectfully traversed.

Claim 10 is an independent base claim. Claims 11, 13, 16, and 17 depend directly from claim 10. The dependent claims include all the limitations of the independent base claim while introducing further limitations thereto.

As presently amended, claim 10 calls in part for:

a polarizing beam splitter comprising a grid polarizer included between first faces of a first and of a second transparent prism,

...

wherein the grid polarizer is formed on the first face of one transparent prism selected from the group including the first prism and the second prism, and

...

wherein an antireflective coating is provided on the first face of the other transparent prism, which other transparent prism lacks the grid polarizer thereon.

None of the limitations shown above are taught, shown, or suggested by the combination of Yajima, Lu, and Shikama.

At the outset, it is clear that Yajima, Lu, and Shikama are silent about the use of an antireflective coating layer, especially one which is placed on “the first face of the other” prism that is opposite “the first face of the one” prism, on which the grid polarizer is formed.

Further, while Yajima does appear to teach the use of a polarization beam splitter on a prism face between two abutting prisms, it is clear that Yajima does not suggest the use of a grid polarizer and that Yajima does not appreciate the patentable significance and benefits gained from using such a grid polarizer as the polarization beam splitter. The USPTO has admitted that Yajima does not disclose this limitation. *See the present Office Action at page 6.* The USPTO has used the Lu reference to find support for using the grid polarizer.

But the combination of Lu and Yajima with respect to the grid polarizer is improper. Lu does appear to show the use of a wire grid polarizer between two prisms. Lu clearly explains in paragraph [0020] that the polarizer is placed on a prism that is separated from the other prism by an air gap or a liquid or gel filled gap. In the limited translation of Yajima provided by the USPTO, Yajima does not appear to teach or suggest the use of a gap of any kind between the two abutting prisms. Neither air nor liquid or gel of any type is discussed by Yajima as being placed between the two prisms. It would appear that the combination of Yajima and Lu would modify the structure of Yajima in such a way that Yajima would appear to operate unsatisfactorily for its intended purpose or under changed principles of operation than those disclosed by Yajima. Under M.P.E.P. §2143.01, especially subsections V and VI thereof, any such combination of the Yajima and Lu references would be improper under 35 U.S.C. §103 because the combination would either render the prior art unsatisfactory for its intended purpose or because it would change the principle of operation of the reference. Thus, the combination of Yajima and Lu fail to teach, show, or suggest all the limitations of independent claim 10 and the claims dependent thereon.

As already stated above, even if one were to assume for the sake of argument alone that one could combine the teachings of Yajima and Lu with respect to the polarization beam splitter to form this grid polarizer on one first face of the first prism or of the second prism, it would not have been obvious to provide an antireflective coating on the other first face of the second or of the first prism, because Lu is both silent about the use of any antireflective coating on a face opposite to, and facing the grid polarizer. Yajima is similarly silent about the use of any antireflective coating layer on one of the abutting faces of the prisms in region 4 shown in Yajima's drawings. Thus, the combination of Yajima and Lu fails to teach, show, or suggest all the limitations of independent claim 10 and the claims dependent thereon.

Shikama et al. does not cure the defects in the teachings of Lu and Yajima discussed above. Shikama fails to teach the use of any polarization device and also fails to provide any teaching related to the use or application of an antireflective coating provided on a face opposite to a face on which a grid polarizer is formed. Without any such teachings, the combination of Shikama, Yajima, and Lu still fails to teach, show, or suggest all the limitations of independent claim 10 and the claims dependent thereon.

For at least these reasons, it is submitted that the elements of claim 10 and the claims dependent thereon would not have been obvious to a person of ordinary skill in the art upon a reading of Shikama, Yajima, and Lu, whether taken separately or in combination. Therefore, it is believed that claims 10, 11, 13, and 17 are allowable under 35 U.S.C. §103. Withdrawal of this rejection is respectfully requested.

Claim 10 further calls in part for “wherein an air gap is provided for cooling between the grid polarizer and the antireflective coating, and wherein the divergence of said light beam is greater than or equal to 5° on either side of the average direction of said beam.” These limitations are not shown, taught, or suggested in the prior art of record.

It is important to control the temperature of the apparatus and, particularly, the polarization beam splitter. This is carried out primarily by cooling the beam splitter. In the claimed invention, cooling is permitted by the introduction of an air gap between the antireflective coating (that is, the grid polarizer) and the polarization beam splitter.

But the use of an air gap, as opposed to the generally accepted technique of using index matching liquid between the antireflective coating and the polarization beam splitter, presents a unique set of problems. These problems arise because air has an optical index lower than is significantly lower than the optical refractive index of the material comprising the prisms. Since the refractive indices are different, the incidence angles of the impinging light beam on the polarization beam splitter are higher when an air gap is used instead of index matching liquid. In turn, the use of the air gap will deleteriously affect the separation performance of certain polarization beam splitters such as multilayer film polarizers and the like.

Further degradation of the separation performance of certain polarization beam splitters such as multilayer film polarizers in the presence of an air gap is assured when the divergence of the impinging light beam is greater than or equal to 5° on either side of the average direction of the beam, as defined in the claims. This further degradation occurs because the polarizing beam splitter claimed divergence insures an even larger divergence when the beam is incident on the polarizing beam splitter separated from the antireflection coating by an air gap. This larger divergence can then degrade the separation performance of the polarizing beam splitter, especially when a multilayer film polarizer is employed. The prior art clearly shows that there are significant limitations on the range of incidence angles for an impinging light beam when

conventional polarization beam splitters are used. *See the present specification at page 2, lines 22-27 referring to the teachings of U.S. Patent 5,716,122 to Esaki in this regard.*

But the present invention as defined in the claims overcomes these limitations in the prior art on the range of incidence angles while simultaneously affording the opportunity to introduce cooling via the air gap. The present claimed inventions uses grid polarizers for polarization beam splitting in the presence of the air gap thereby achieving cooling for the polarization beam splitting mechanism and also maintaining a satisfactory separation performance over a wide range of incidence angles for the impinging light beam. At page 3, lines 22-25 of the specification, it is stated that “[t]hanks to the use of a grid polarizer, the polarization can be effectively separated over a wide range of angles of incidence.” The divergence for an average direction of the incident light beam can even be greater than or equal to 10°. *See the specification at page 8, lines 3-28.*

For all these additional reasons, it would not have been obvious to utilize the claimed limitations “wherein an air gap is provided for cooling between the grid polarizer and the antireflective coating, and wherein the divergence of said light beam is greater than or equal to 5° on either side of the average direction of said beam” to solve the problems of the prior art. None of the cited references teach, show, or suggest the limitations defined in claim 10 and the claims dependent thereon. Thus, it is submitted that the elements of claim 10 and the claims dependent thereon would not have been obvious to a person of ordinary skill in the art upon a reading of Shikama, Yajima, and Lu, whether taken separately or in combination. It is therefore believed that claims 10, 11, 13, and 17 are allowable under 35 U.S.C. §103. Withdrawal of this rejection is respectfully requested.

Conclusion

In view of the foregoing, it is respectfully submitted that all the claims pending in this patent application are in condition for allowance. Entry of this amendment, reconsideration of the application, and allowance of all the claims are respectfully solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application, it is requested that the Examiner contact the Applicants’ attorney, so that a mutually convenient date and time for a telephonic interview may be scheduled for resolving such issues as expeditiously as possible.

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In the event there are any errors with respect to the fees for this response or any other papers related to this response, the Director is hereby given permission to charge any shortages and credit any overcharges of any fees required for this submission to Deposit Account No. 07-0832.

Respectfully submitted,

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